CLAIMS

1. A process for forming a resin from reactants, the reactants comprising fatty acid, resin acid, aldehyde and phenolic compound that is at least trifunctional with respect to aldehyde reactivity, the process comprising maintaining the reactants at elevated temperature for a time sufficient to form the resin.

2. The process of claim 1 wherein the reactants further comprise polyol.

3. The process of claim 1 wherein the reactants further comprise α,β-olefinically unsaturated carbonyl compound.

4. The process of claim 1 wherein the reactants further comprise metal oxide.

5. The process of claim 1 wherein the reactants comprise phenol.

6. The process of claim 1 wherein the reactants further comprise phenolic compound other than phenol.

7. The process of claim 1 wherein the resin has an acid number of 1-70.

8. The process of claim 1 wherein the resin has a softening point of 100-230°C.

9. The process of claim 1 wherein the resin has a softening point in excess of 110°C.

10. The process of claim 1 wherein the resin has a peak molecular weight of 30,000-500,000.

11. The process of claim 1 wherein a 45wt% solution of the resin in PKWF 6/9 AR has a flow viscosity of 0.1-450 Pa.s at 25°C.

12. The process of claim 1 wherein a 45wt% solution of the resin in PKWF 6/9 AR has a flow viscosity of 0.1-150 Pa.s at 25°C

13. The process of claim 1 wherein a 45wt% solution of the resin in PKWF 6/9 AR has a tan delta of infinite to 1.5.

14. The process of claim 1 wherein a 10wt% solution of the resin in M47 solvent has a cloud point of less than about 50°C.

15. The process of claim 1 wherein a 10wt% solution of the resin in M47 solvent has a cloud point of 50-150°C.

16. The process of claim 1 wherein a 10wt% solution of the resin in M47 solvent has a cloud point of greater than about 150°C.

17. The process of claim 1 wherein a 10wt% solution of the resin in M47 solvent has a cloud point of 75-180°C.

18. The process of claim 1 wherein the resin is completely soluble in M47 at 10% solids at 180C.

19. The process of claim 1 wherein the resin is self-gelling in mineral oil at a resin:mineral oil weight ratio of 1:1.5.

20. The process of claim 1 wherein the resin has a viscosity at 35% solids of 50-350 mPa-secs as measured on a rotational viscometer.

21. The process of claim 1 wherein the resin has a dilutability of 60-280 mLs toluene, DIN 3 at 21°C, starting from 100 grams of a 35% resin solids toluene solution.

22. The process of claim 1 wherein the resin is suitable for use as a lithographic ink resin.

23. The process of claim 1 wherein the resin is suitable for use as a gravure ink resin.

24. The process of claim 1 wherein phenol constitutes at least 20wt% of phenolic compound present in the reactants.

25. The process of claim 1 wherein phenol constitutes at least 35wt% of phenolic compounds present in the reactants.

26. The process of claim 1 wherein resin acids constitute 30-60wt% of the reactants, based on the total weight of the reactants.

27. The process of claim 1 wherein rosin is a source of resin acids.

28. The process of claim 1 wherein fatty acids constitutes up to 65wt% of the reactants, based on the total weight of the reactants.

29. The process of claim 1 wherein fatty acid constitutes 5-40wt% of the total weight of the reactants, excluding fatty acid present in rosin.

30. The process of claim 1 wherein fatty acid constitutes 10-40wt% of the total weight of the reactants, excluding fatty acid present in rosin.

31. The process of claim 1 wherein the reactants comprise a rosin selected from the group consisting of tall oil rosin, gum rosin and wood rosin, and the fatty acid comprises compounds of the formula R^1-COOH wherein R^1 is a hydrocarbyl group having at least 14 carbons.

32. The process of claim 31 wherein rosin constitutes 35-90wt%, fatty acid constitutes 10-35wt%, and the total weight of phenolic compound + aldehyde constitutes 10-30wt%, based on the total weight of the rosin, fatty acid, phenolic compound and aldehyde present in the reactants.

33. The process of claim 32 wherein the weight of rosin in the reaction mixture is at least 50% greater than the weight of fatty acid present in the reaction mixture.

34. The process of claim 31 wherein the reactants further comprise polyol.

35. The process of claim 34 wherein the polyol is pentaerythritol.

36. The process of claim 31 wherein the reactants further comprise α,β-olefinically unsaturated carbonyl compound.

37. The process of claim 36 wherein the α,β-olefinically unsaturated carbonyl compound comprises maleic anhydride.

38. The process of claim 1 wherein fatty acid constitutes 5-40wt% of the total weight of the reactants, excluding fatty acid present in rosin.

39. The process of claim 1 wherein aldehyde constitutes up to 40wt% of the total weight of the reactants.

40. The process of claim 1 wherein aldehyde constitutes 5-15wt% of the total weight of the reactants.

41. The process of claim 1 wherein phenolic compounds including phenol constitute up to 50wt% of the total weight of the reactants.

42. The process of claim 2 wherein the polyol constitutes up to 15wt% of the total weight of the reactants.

43. The process of claim 2 wherein the polyol constitutes 5-15wt% of the total weight of the reactants.

44. The process of claim 3 wherein the α,β-olefinically unsaturated carbonyl compound constitutes up to 8wt% of the total weight of the reactants.

45. The process of claim 3 wherein the α,β-olefinically unsaturated carbonyl compound constitutes 0.05-7wt% of the total weight of the reactants.

46. The process of claim 4 wherein the metal oxide constitutes 0.01-1wt% of the total weight of the reactants.

47. The process of claim 1 wherein the reactants comprise rosin, and rosin is a source of the resin acids.

48. The process of claim 1 wherein Tall Oil Rosin is a source of the resin acids.

49. The process of claim 1 wherein gum rosin and/or wood rosin is a source of the resin acids.

50. The process of claim 1 wherein the resin acid is selected from resin acid salt, resin acid ester, resin acid dimer and resin acid adduct.

51. The process of claim 1 wherein the resin acid is natural resin acid.

52. The process of claim 51 wherein the fatty acid comprises Tall Oil Fatty Acid or Monomer.

53. The process of claim 1 wherein the reactants comprise Monomer, and Monomer is a source of the fatty acids.

54. The process of claim 1 wherein the reactants comprise vegetable-based fatty acid, where the vegetable-based fatty acid is a source of fatty acid.

55. The process of claim 1 wherein the reactants comprise animal derived fatty acid, where the animal derived fatty acid is a source of fatty acid.

56. The process of claim 1 wherein the reactants comprise fatty acid ester, and fatty acid ester is a source of fatty acid.

57. The process of claim 1 wherein the reactants comprise paraformaldehyde, and paraformaldehyde is a source of the aldehyde.

58. The process of claim 1 wherein azeotropic distillation is not used to remove water from the resin.

59. The process of claim 1 wherein an inert organic solvent capable of azeotropic distillation of water at the elevated temperature is not used as an entraining agent for azeotropic distillation of water.

60. A resin prepared by the process of any of claim 1.

61. A varnish comprising a resin prepared by the process of any of claim 1 and a solvent.

62. The varnish of claim 61 wherein the solvent is a hydrocarbon.

63. A lithographic ink comprising a resin of claim 60.

64. A gravure ink comprising a resin of claim 60.

65. A process for preparing a resin, the process comprising reacting reactants at elevated temperature, the reactants comprising rosin, fatty acid, aldehyde and phenolic compound that is at least trifunctional with respect to reactivity with aldehyde, where the phenolic compound that is at least trifunctional constitutes at least 25wt% of all phenolic compounds used to form the resin.

66. The process of claim 65 wherein phenol constitutes at least 35 wt% of the phenolic compounds.

67. The process of claim 65 wherein phenol constitutes at least 55 wt% of the phenolic compounds.

68. The process of claim 65 wherein the rosin constitutes up to 85 wt% of the reactants.

69. The process of claim 68 wherein rosin constitutes 35-70wt% of the reactants.

70. The process of claim 65 wherein the fatty acid constitutes up to 65 wt% of the reactants.

71. The process of claim 70 wherein the fatty acid constitutes 5-40wt% of the reactants.

72. The process of claim 65 wherein the aldehyde constitutes up to 40 wt% of the reactants.

73. The process of claim 72 wherein the aldehyde constitutes 5-15wt% of the reactants.

74. The process of claim 65 wherein phenolic compound(s) constitute up to 50 wt% of the reactants.

75. The process of claim 74 wherein phenolic compound(s) constitute 5-15wt% of the reactants.

76. The process of claim 65 wherein the fatty acid comprises Tall Oil Fatty Acid (TOFA).

77. The process of claim 65 wherein the fatty acid comprises Monomer.

78. The process of claim 65 wherein the aldehyde comprises formaldehyde.

79. The process of claim 65 wherein the rosin comprises gum rosin.

80. The process of claim 65 wherein the rosin comprises tall oil rosin.

81. The process of claim 65 wherein the reactants further comprise polyol.

82. The process of claim 81 wherein the polyol constitutes up to 15 wt% of the components.

83. The process of claim 82 wherein the polyol comprises pentaerythritol.

84. The process of claim 65 wherein the reactants further comprise an α,β-olefinically unsaturated carbonyl compound.

85. The process of claim 84 wherein the α,β-olefinically unsaturated carbonyl compound constitutes up to 8 wt% of the components.

86. The process of claim 85 wherein the α,β-olefinically unsaturated carbonyl compound comprises maleic anhydride.

87. The process of claim 65 wherein the resin is self-gelling in mineral oil at resin:mineral oil weight ratio of 1:1.5.

88. The process of claim 65 wherein the resin is completely soluble in mineral oil at 10% solids at 180°C.

89. The process of claim 65 wherein the resin has a softening point in excess of 120°C.

90. The process of claim 65 wherein a 45 wt% solution of the resin in a hydrocarbon solvent has a flow viscosity at 25°C of 0.1 to 150 pascal-seconds.

91. The process of claim 65 wherein the resin is suitable for use as a lithographic ink resin.

92. The process of claim 65 wherein the resin is suitable for use as a gravure ink resin.

93. The process of claim 65 wherein azeotropic distillation is not used to remove water from the resin.

94. The process of claim 65 wherein an inert organic solvent capable of azeotropic distillation of water at the elevated temperature is not used as an entraining agent for azeotropic distillation of water.

95. A resin prepared by the process of claim 65.

96. A varnish comprising a resin prepared by the process of claim 65 and a solvent.

97. The varnish of claim 96 wherein the solvent is a hydrocarbon.

98. A lithographic ink comprising a resin of claim 95.

99. A gravure ink comprising a resin of claim 95.

100. A process for preparing a resin, the process comprising reacting reactants at elevated temperature, the reactants comprising resin acid, fatty acid, aldehyde and phenolic compound that is at least trifunctional with respect to reactivity with aldehyde, where the fatty acid contributes at least 5% of the weight of the listed reactants, and the resin has a softening point of at least 105°C.

101. The process of claim 100 wherein the resin has a softening point of at least 120°C.

102. The process of claim 100 wherein the fatty acid contributes at least 15% of the weight of the listed reactants.

103. The process of claim 100 wherein the fatty acid contributes at least 20% of the weight of the listed reactants.

104. The process of claim 100 wherein phenolic compound that is at least trifunctional with respect to reactivity with aldehyde constitutes at least 5wt% of all phenolic compounds present among the reactants.

105. The process of claim 100 wherein phenolic compound that is at least trifunctional with respect to reactivity with aldehyde constitutes at least 10wt% of all phenolic compounds present among the reactants.